

MCX Environmental Energy Corp.

DER Road Show Presentation on MicroTurbines



**Power when and where you need it.
Clean and simple.**





Presentation Highlights

- Centralized Generation Paradigm
- Distributed Generation Alternative
- MicroTurbine Technology Overview
- Applications



Energy Crisis?

- Blackouts, energy shortages, distribution & delivery problems
- Electricity prices experiencing fluctuation due to market conditions
- It figures to get worse before it gets better

"If you thought last week's blackout in Detroit was bad, take a deep breath: Michigan is in danger of running short of electricity this summer."

--Detroit News

June 19, 2000

"Millions of Consolidated Edison customers got a rude shock last month when they discovered even though this was one of the coolest summers in memory, their electricity bills had increased by an average of 43 percent over last summer."

--New York Times Aug. 22, 2000

"Future costs for ratepayers will explode. Residents and businesses could face hefty surcharges for years, even if new plants are built."

--San Diego Union-Tribune Sept 12, 2000

Power Crisis: Latest Developments

"California power regulators extend a Stage 3 alert for the 31st straight day, scrambling to find enough power to avert rolling blackouts."

**--Daily News
Feb 16, 2001**

"Temperatures and power bills across San Diego County remained near record levels again yesterday, and neither is likely to drop anytime soon."

--San Diego Union-Tribune Sept 12, 2000

"Pacific Gas and Electric officials are warning customers of huge increases in their next bills, and it's a hike that they blame on power demands that are going through the roof."

--KCRA-TV Nov 16, 2000



Large-Scale Centralized Generation

- SIZE: 50 - 1,000 MW
- PERMITTING: Can be difficult
- TIMING: 2-3+ years to build
- EFFICIENCY: Latest designs up to 60%
 - But micro-cogen yields 70-90%
- EMISSIONS: NO_x approximately 25 ppm
- CONNECTION: Assumes access to the grid



The Grid: Transmission & Distribution

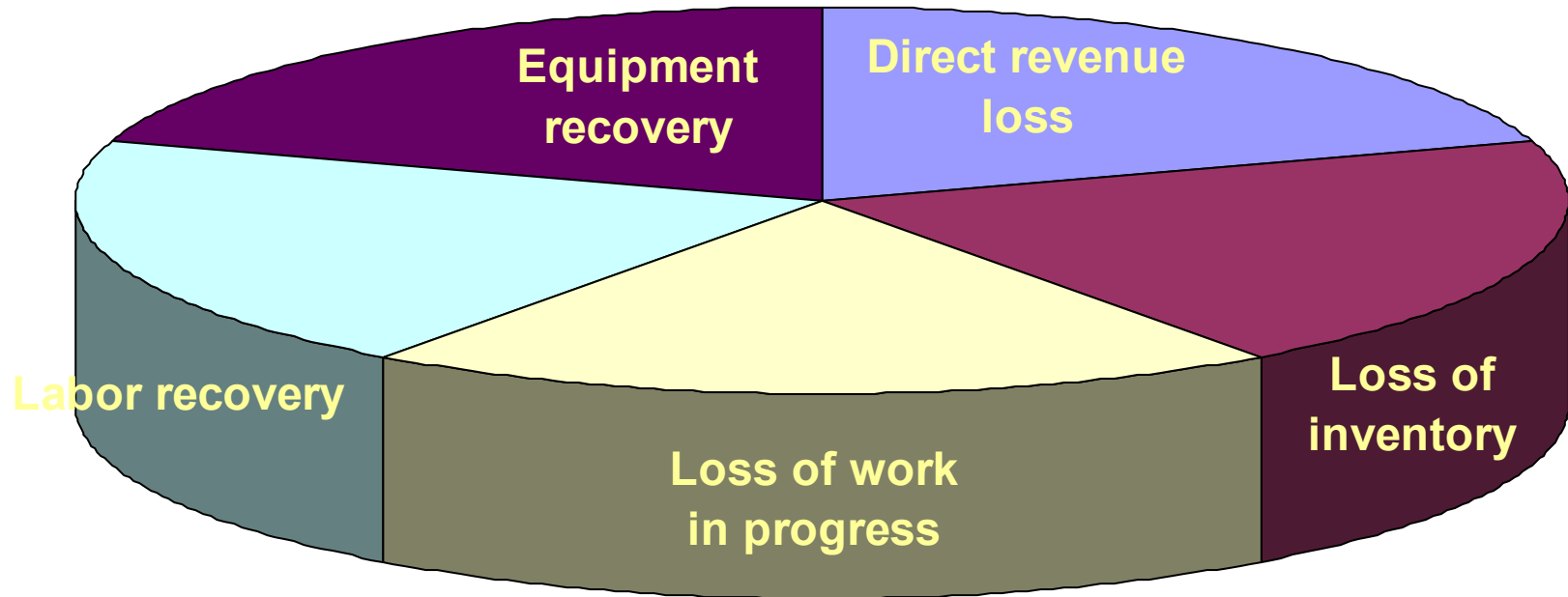
- New T&D costs up to \$100,000/mile
- 6-7% electric line losses
- \$400-500/kW
- Difficult to obtain right-of-ways



The Cost of Power Problems

“Outages cost facilities an average of \$4,000 to \$11,000 each, although many end users suffer much greater losses. For example, one semiconductor manufacturer reports that a single five-second outage could cost the company \$12 million in lost production alone -- the equivalent of its entire annual electricity bill.”

--E-Source, May 1999





Small-Scale Distributed Generation

- Generate the power where it's used
- Fast & easy installation & operation
- Boost capacity w/o utility costs/delays
- Ensure a high level of power quality
- Ensure a high level of power reliability
- Give end-users energy cost control
- Maximize energy efficiency via CHP
- But...for DG to work, it must be safe, it must be clean, and it must be affordable



The Technology to Make it Work

- The approach: using microturbines as an onsite power plant
 - Transparent to end-user
 - Affordable n+1 or greater reliability for critical loads
 - Rapid deployment
 - Near-zero maintenance
 - Ultra-low emissions
 - Minimal parts inventory
 - Easy scalability (100+ units)
 - Remote monitoring





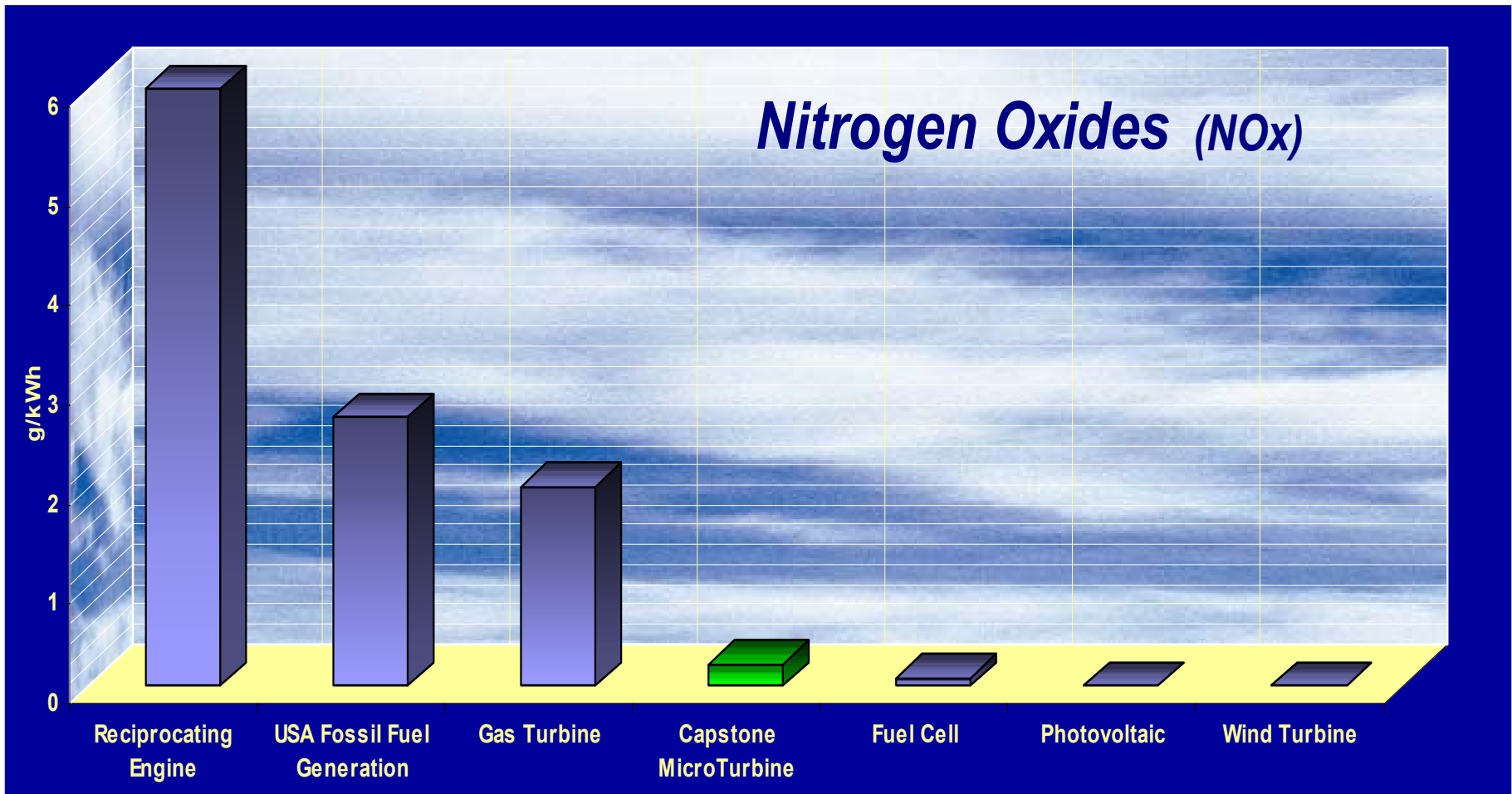
It Must Be Safe

- The Capstone MicroTurbine is listed to UL 2200, the new generator standard
 - Low-pressure natural gas
 - High-pressure NG & propane
- Capstone's is the world's first and only microturbine to be UL-Listed
- Capstone MicroTurbines are the only generators of any type state-approved by New York for DG interconnection
- Recently received UL 1741 to ensure safe interconnection with utilities

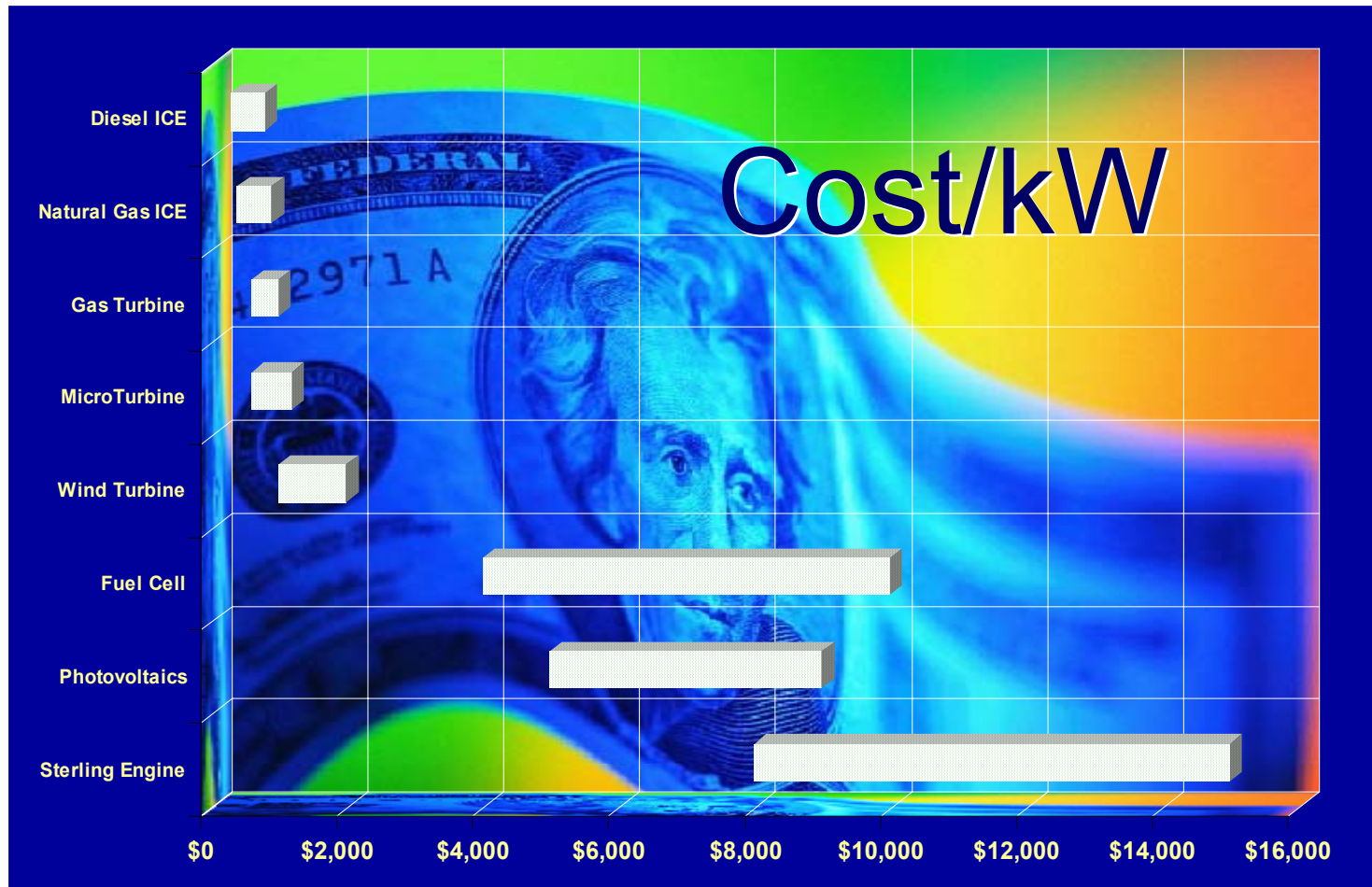


It Must Be Clean

The Capstone MicroTurbine approaches the performance of zero-emissions technologies, but at a fraction of the cost...



It Must Be Affordable

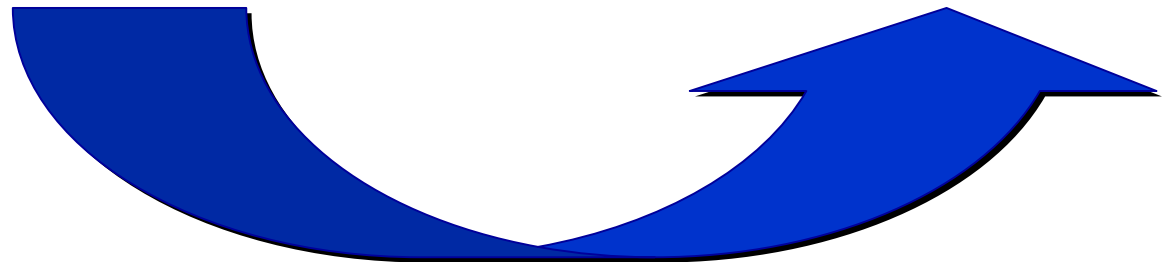


MicroTurbine Technology: Unique Design Characteristics

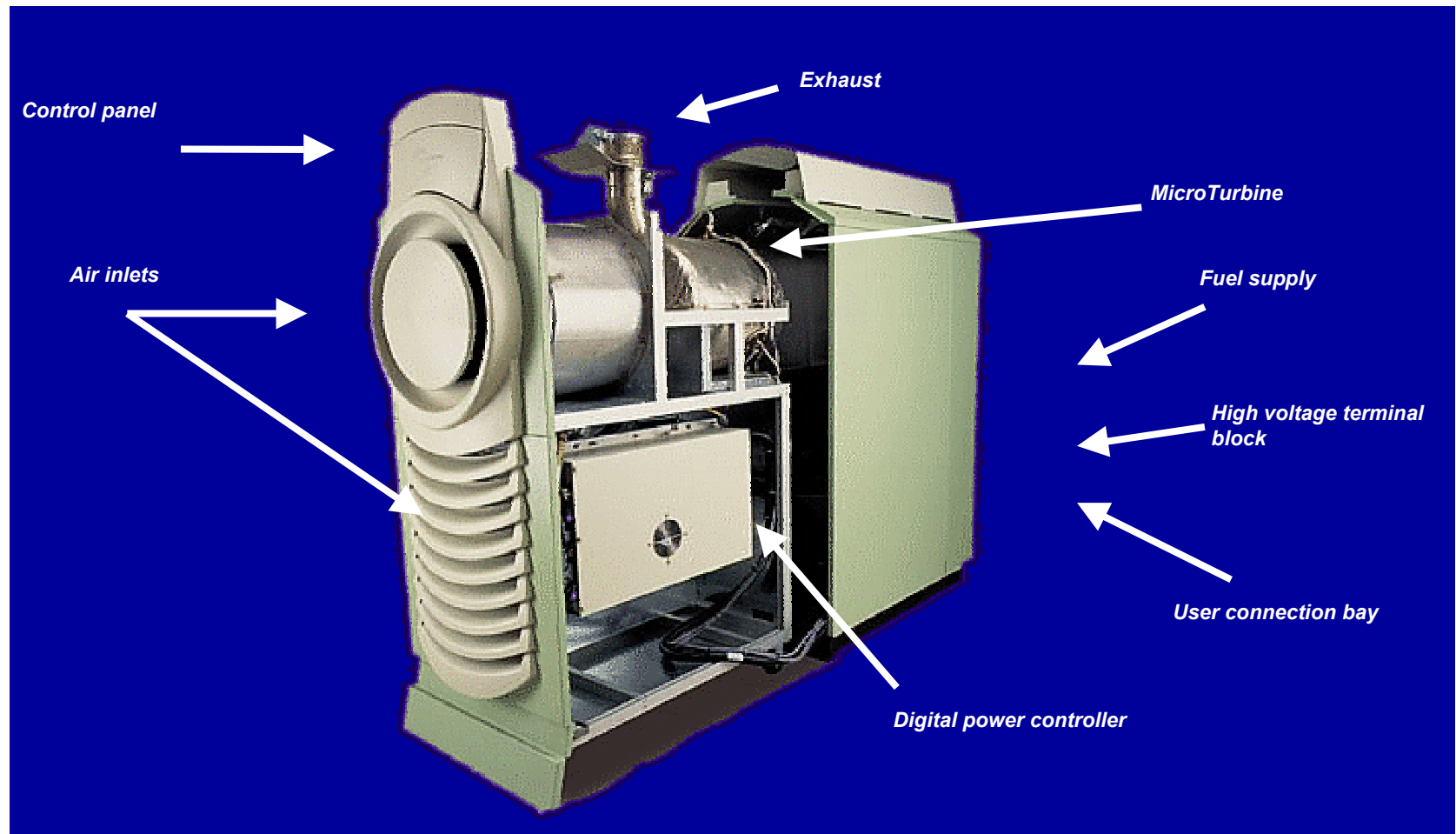


- Simple, low pressure ratio, low temperature, robust design
- Single moving part supported by patented air bearings
 - Eliminates the need for liquid engine lubricants
 - Reduces maintenance costs
 - Increases system life
- Air cooling of the electronics
 - Eliminates need for liquid cooling systems
- Low exhaust and acoustic emissions
 - Less than 9 ppm NOX
 - No vibration, low noise [65 dba @10 m: ideal for noise-sensitive areas, e.g. near data rooms]

- High Reliability
- Low Maintenance
- Low Emissions
- Versatility of Use

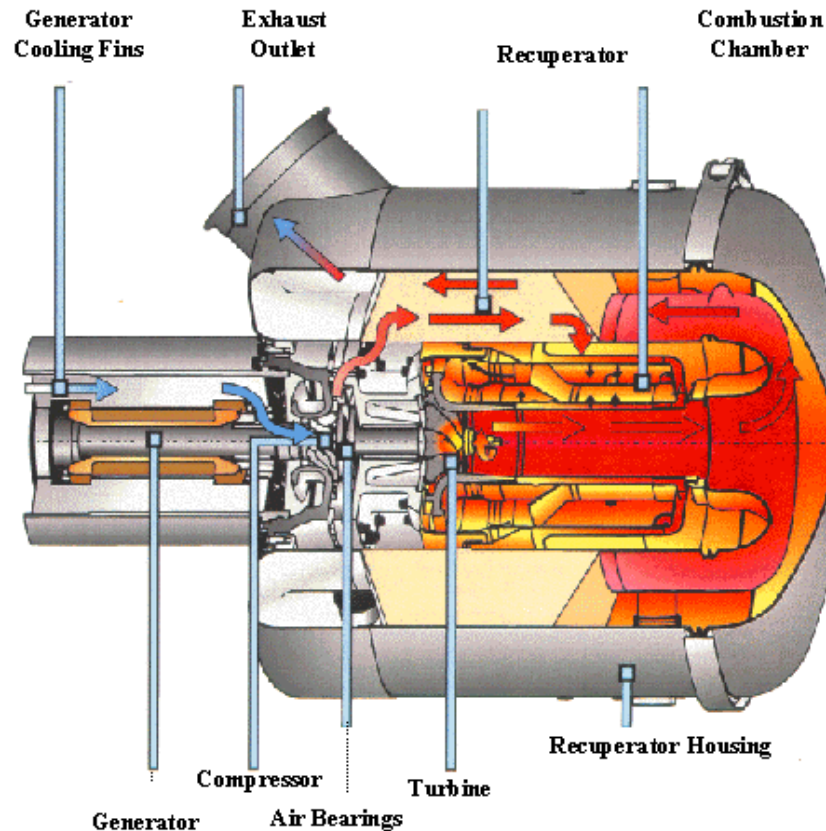


MicroTurbine Technology: Inside the Capstone MicroTurbine



*3,000,000+ Hours
Operational Experience*

MicroTurbine Technology: Capstone Engine



The Capstone MicroTurbine™ has patented air bearings that eliminate the need for liquid lubricants.



“Most Innovative Commercial Technology”



- ***November 30, 2000: Capstone Turbine Corporation wins the coveted Most Innovative Commercial Technology Development award at the Financial Times Global Energy Awards***



Multiple Units Installation

Multipac

2 to 20 units

- Single control point, grid connect or stand alone
- All units share load equally
- If master fails another unit is configured as master



Power Server Controller

21 to 100 units

- Intelligent Dispatch
- Ethernet/ModBus/Lonworks
- Assumes Role Of Master



Multiple unit installations allows to spread out installation costs among many more kW's.

Capstone MicroTurbines: Performance Data and Specifications



Characteristic	Performance	
	<u>MODEL M330</u>	<u>CAPSTONE 60</u>
Output	30/28 kW Net (+/-1)	60 kW Net (+/-1)
Efficiency	27% (+/-2)	26% (+/-2)
Fuel Flow	410,000 BTU/hr - HHV	871,000 BTU/hr - HHV
Exhaust Temperature	520° F	649° F
Total Exhaust Energy	277,000 BTU/Hr	640,000 BTU/Hr
Projected O&M Costs	\$0.008/kWh	
Emissions	NOx (<9 ppmV)	
Noise level	65 dBA at 10 meters	
Voltage	400-480 VAC 3 phase, 50 or 60 Hz	
Weight	1052 LB	1340 LB
Size	74.8”h x 28.1”w x 52.9”d	80”h x 30”w x 76”d

The Capstone MicroTurbine™ is smaller in footprint and quieter than conventional generation technologies.



How Do MicroTurbines Compare to Recips?

	<u>Conventional GenSet</u>	<u>Capstone MicroTurbine</u>
Life Resource	10, 000 to 15,000 hrs	40,000+ hrs
Oil Change	Yes	No
Water Cooling	Yes	No
Ultra Low Emissions	No	Yes
Heat Recovery Capability	Limited	Yes
Paralleling Gear	Optional	Integrated
Maintenance Frequency	Monthly	Annually
Grid-Quality Power	No	Yes
Multipac Configuration	Requires optional gear	Up to 100 units
Noise Level/Vibration	Loud/Present	As low as 55dBA*/None

**-With optional silencer kit*



Applications: Hybrid Electric Vehicles (HEV)

- Increased Range (vs. Electric Only)
- 1/25th of Diesel Emissions
- Electric and Hybrid Electric Vehicles in AZ, CA, FL, TN



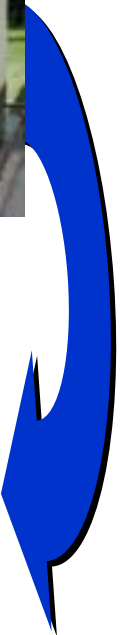
CARTA 714 - Hybrid Electric

Applications:

CHP - Health Club, Southern California



- Description
 - Health club with hot water needs for showers, pool and spa
 - Sufficient heat load to operate 8 months out of the year
- Customer needs
 - Energy savings
 - Interest in new technology
- Value proposition
 - Reduction in total energy costs
 - Reduction of gas price for entire facility
- Installation details
 - Unifin Heat Exchanger
- Economics
 - 35.98% IRR
 - 2.8 year payback



Applications:

Peaking/Stand-by - Convenience Store



- Description
 - Convenience Store Chain
 - 40kW load (less than 30 kW critical)
- Customer needs
 - Avoid spoilage costs of refrigerated products
 - Remain in operation during brownouts and blackouts
- Value proposition
 - Reduced material spoilage costs
 - Increased revenue/profits
- Installation details
 - Outdoor installation
 - Isolated critical loads (25-28 kW)
 - Automatic dispatching (using Dual Mode Controller)





Applications: Power Reliability & CHP

- Description
 - Plastics manufacturing facility
 - Self-generation utilizing
- Customer needs
 - Increased power reliability/quality to support sensitive molding processes
 - Energy Savings
- Installation details
 - 24 30 kW MicroTurbines on Stand-alone mode with Power Server
 - Six Unifin heat exchangers
 - Heat recovered for space heating in the winter and a/c (via absorption chillers)
 - Black start w/propane





Applications: Landfill Gas Recovery

- Description
 - 25 MicroTurbine array at Lopez Canyon, CA landfill
- Customer needs
 - Avoidance of penalty for flaring methane generated from landfill's waste
 - Utilization of fraction of power on-site, rest sent to grid
- Installation details
 - 25 30 kW MicroTurbines in Stand-alone mode
 - Gas clean-up, compression and combustion all achieved with integrated “skid”

